

Walter discloses a rather complex process for preparing phosphoric acid-treated ammonium alkaline earth and/or alkaline earth metal salts from tri- calcium phosphate-containing material. The process is outlined in Attachment A.

In all the Examples 2 to 4, the starting material is dihydrogenophosphate (MCP) crystals. A method for producing such MCP crystals from phosphate rock is disclosed in Example 1 (page 6, two last lines and page 7, lines 1 to 6 of the English translation) and illustrated in the first line of Attachment A. In this step Walter discloses a purification wherein the rock is mixed with concentrated phosphoric acid at high temperature, the obtained slurry is cooled, filtered and washed with concentrated phosphoric acid. The major part of the impurities are dissolved during this treatment which results in a solid phase of pure MCP crystals and a filtrate constituted of phosphoric acid that contains the major part of the impurities as well as calcium ions.

This preliminary step is clearly done for purification purposes, in order to remove impurities originating from the rock. The Walter process needs a purified phosphate source as raw material for the second step of the process. On page 3, lines 3 to 6 of the Office Action, the examiner recognizes that this preliminary step renders the Walter method complex and expensive.

In the second step of the Walter process the purified MCP crystals are dissolved in water to form a suspension of solubilized MCP crystals (liquid phase) and the remaining impurities (solid phase). In Walter, page 7, line 8, it is stated that "(t)he small insoluble fractions,  $\text{SiO}_2$  in particular, were filtered off."

The literature teaches that the  $\text{SiO}_2$  content of phosphate rock is typically comprised between 1.0 and 5% by weight (Pierre Becker, Phosphate and Phosphoric Acid, Fertilizer science and technology services – Vol. 6, 1989, Marcel Dekker Inc., pages 628-717). The amount of impurities removed by this second filtration is then a maximum 1 to 5 g for 100 g of rock.

A strong base is then introduced in the filtrate constituted of a MCP solution, which results in a precipitation of solid DCP still containing impurities (see particularly page 4, lines 8 and 9 of the English translation of Walter). The obtained liquid phase is a purified solution of a strong base phosphate (see line 2 Attachment A).

This solution is then submitted to a further neutralization for precipitating a strong base phosphate (see line 4 of Attachment A).

#### Process According to the Present Invention

The process according to the present invention (See Attachment B) involves a method wherein TSP is prepared in the first step. The TSP is produced by a reaction of phosphoric acid and rock under such conditions that a pasty composition is obtained wherein all the impurities from the

rock remain undissolved. These conditions are mild and known. It is also known that TSP is a low quality phosphate compound, used as fertilizer, which can be dried and granulated as disclosed in the MacDonald patent.

In step b) of the present invention water is added to the pasty TSP composition or to the dried TSP, leading to a MCP solution wherein the impurities remain insoluble and are removed as a solid residue cake by filtration.

Example 1 of the present application shows that at the pH obtained before the step (c), i.e., pH of 2-3, the most metal impurities at the exception of Ca are precipitating. For 100 g of rock present in the TSP when mixed with water, 100 g of solid impurities are removed as a solid concentrate (see page 6, lines 6-7). This solid concentrate contains humidity (about 40% by weight) and  $\text{SiO}_2$ , as well as the heavy metals and other contaminants, such as fluorine, which are present in the rock.

It results from the process according to the present invention that the filtrate is surprisingly a pure solution of MCP. This solution can be submitted to a neutralization by a strong base in order to obtain as final product a strong base  $\text{P}_2\text{O}_5$  solution which can be used as phosphate of technical grade for preparing for example STPP (triplyphosphate of sodium) (see page 4, lines 22 to 18 of the specification).

The approach of the present invention is completely different from the approach of Walter. In the present invention the used source material is a low-quality, cheap and impure phosphate source (TSP) and the

impurities are removed as a solid cake, while in the Walter patent the source material consists in pure MCP crystals, obtained by a very complex purification system wherein the impurities are previously removed by dissolution in phosphoric acid.

A table wherein the different quality grades of phosphate products are summarized is found in Attachment C.

In the Office Action, page 3, § 5, the examiner asserts that for a person of ordinary skill in this art it would have been obvious to substitute purified MCP crystals of Walter by a slurry formed by reacting phosphate rock and phosphoric acid as taught by MacDonald, i.e., by TSP, because MacDonald teaches this mixture forms a stable fluid slurry. However, the examiner fails to ask why the raw material in the Walter patent is pure MCP crystals. The reply is obviously because Walter would have never imagined to start his process for manufacturing strong base phosphates of high purity grade with a material (TSP) which was known to contain a great portion of impurities.

The applicant asserts that at the priority date of the present patent application a person of ordinary skill, having knowledge of the Walter patent, would never have been prompted to adapt the method according to this prior art while substituting the very pure starting material by the extremely impure material obtained in MacDonald in order to make high quality phosphate salts to be used in the field of detergents for example.

The examiner's prior art rejection based on Walter and MacDonald should be withdrawn.

The examiner has rejected claims 5 and 15 under 35 U.S.C. 103(a) as being unpatentable over Walter in view of MacDonald and Wesenberg, and he has rejected claim 12 under 35 U.S.C. 103(a) as being unpatentable over Walter in view of MacDonald and Smith et al.

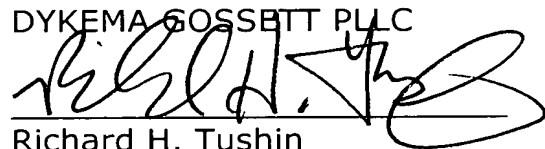
However, neither Wesenberg or Smith et al. can overcome the basic deficiencies in the examiner's attempted combination of Walter and MacDonald as noted above.

Favorable reevaluation of this application is requested.

Respectfully submitted,

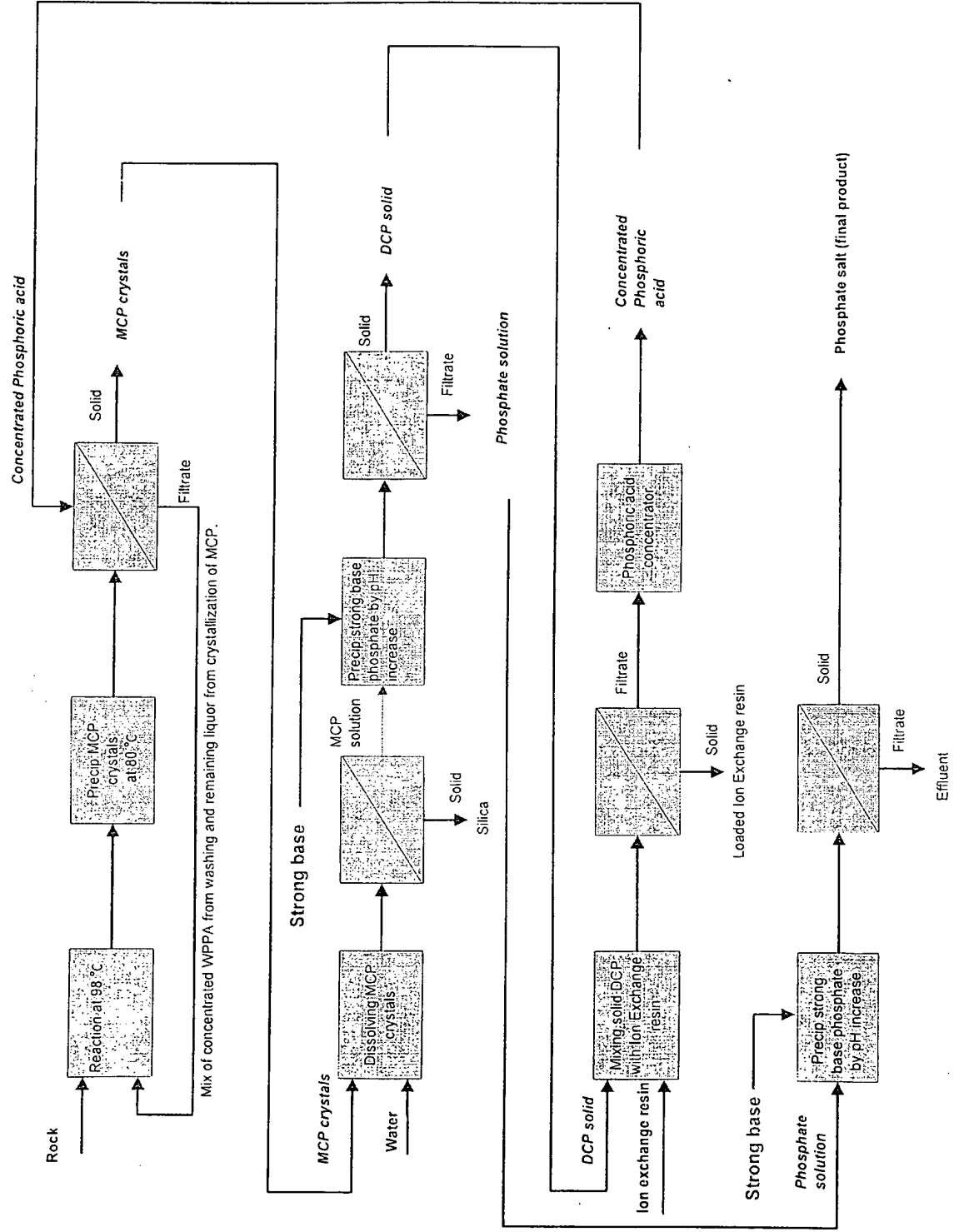
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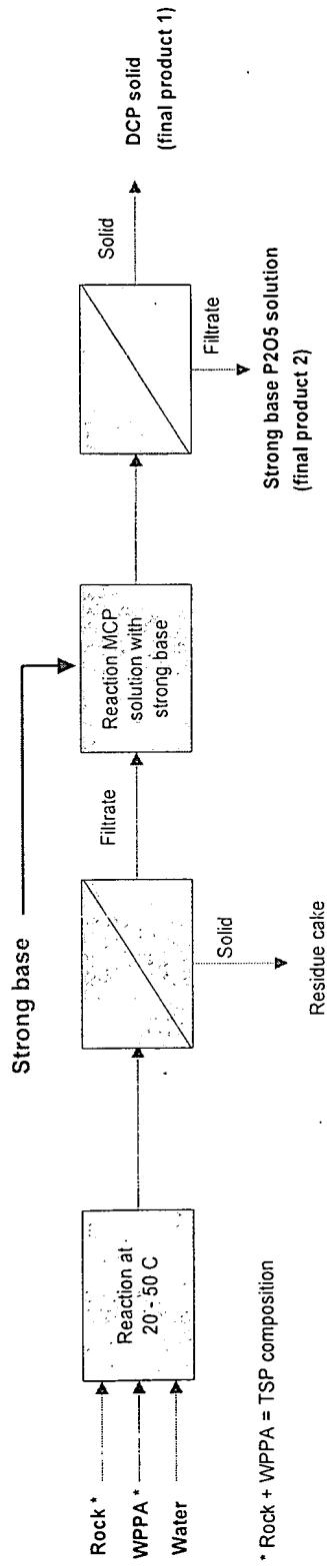


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# ATTACHMENT A (Walter Process)



## ATTACHMENT B (Present Process)



Applications	Purity	Price	Marked size	Examples
Fertilizers (from rock)	Low	Low	Big	Phosphate rock
				SSP - Single superphosphate
				TSP - Triplesuperphosphate
Fertilizer (from Phosphoric acid)				MAP-Mono ammonium phosphate DAP - Di-amonium phosphate
Animal feed				DCP-Dicalcium phosphate MCP-Monocalcium phosphate
				H3PO4 -Phosphoric acid
Technical grade				STTP - Sodium triple polyphosphate
Food/pharma grade	High	High	Small	DCP-Dicalcium phosphate MCP-Monocalcium phosphate
				H3PO4 -Phosphoric acid
				H3PO4 -Phosphoric acid
Electronical grade				

# ATTACHMENT C